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Claims

1. An adapter for coupling a laser treatment device (1) with an object (2) to be
5 processed, wherein the adapter (12)
- comprises an adapter input side (21), which can be fixated relative to the laser processing
device (1) via a locking mechanism (H);
- is attachable to the object (2) for positioning of the object (2) relative to the laser processing
device (1);
10 - transmits a laser beam (4) to the object (2) along an adapter beam path, said laser beam
having been supplied to the adapter input side (21) by the laser processing device (1) and
scanned over a certain region, and
- comprises a reference structure (24),
characterized in that
15 the reference structure (24) is located in the adapter beam path and is optically detectable by
means of the laser radiation (4) scanned across said region.
2. The adapter as claimed in Claim 1, characterized in that for checking the alignment of
the adapter (12) the reference structure (24) is optically position-detectable.
- 20 3. The adapter as claimed in Claim 2, characterized in that the reference structure (24)
comprises at least one spatial zone (25) of the adapter beam path, which differs from the
remaining adapter beam path in at least one optical property.
- 25 4. The adapter as claimed in any one of the above Claims, characterized by an adapter
output side (22), which outputs laser radiation (4) supplied to the adapter input side (21) and
which can be brought into contact with a deformable surface (17) of the object (12) and thereby
imparts a desired shape (19) to said surface (17).

5. The adapter as claimed in any one of the above Claims, characterized in that the reference structure (24) reflects the actual spatial position of the adapter (12).

6. Laser processing device for the use of an adapter as claimed in any one of the above Claims in combination with Claim 2, comprising a beam deflecting unit (6, 9) for scanning a laser beam (4) over the certain region,

characterized by

- a detecting unit (5, 15) for optical detection of the reference structure (24) by means of the laser beam (4), and

- a control unit (14), which reads out the detecting unit (5, 15), controls the beam deflecting unit (6, 9), determines the actual position of the adapter (12) on the basis of the optically detected reference structure (24) and considers said position when controlling the beam deflecting unit (6, 9).

7. The laser processing device as claimed in Claim 6, characterized in that, when controlling the beam deflecting unit (6, 9), the control unit considers a difference between a desired position and the actual position of the adapter (12).

8. The laser processing device as claimed in Claim 6 or 7, characterized in that the control unit (14) determines a difference between a desired position and the actual position of the adapter (12) and blocks the processing operation if the difference exceeds a threshold value.

9. The adapter as claimed in Claim 1, characterized in that it comprises an adapter output side (22) which can be brought into contact with the deformable surface (17) and thereby imparts a desired shape (19) to said surface (17), wherein the adapter (12) is attachable to the object (2), and in that the reference structure is provided as marking structures (25) which encode information characterizing the adapter (12).

10. The adapter as claimed in Claim 9, characterized in that the reference structure (24) comprises spatial zones (25) of the adapter beam path, which differ from the remaining adapter beam path in at least one optical property.

11. The adapter as claimed in Claim 10, characterized in that the optical property is the refractive index.

12. The adapter as claimed in any one of the above Claims, characterized in that the adapter beam path at least partially comprises a material (20), in particular glass, which is transparent for the processing laser radiation.
- 5 13. The adapter as claimed in Claim 12, characterized by a cylindrical or frustoconical body, one end surface (22) of which is provided as the adapter output side having the desired shape (19) of the surface (17).
- 10 14. The adapter as claimed in Claim 12, characterized by a cylindrical or frustoconical body (20), one end surface (21) of which is provided as the adapter input side.
- 15 15. The adapter as claimed in any one of the above Claims, characterized by a flange (23) for the locking mechanism (H).
- 16 16. The adapter as claimed in any one of the above Claims, characterized by a suction attachment unit for attachment to the object (2).
- 20 17. The adapter as claimed in any one of the above Claims in combination with Claim 9, characterized in that the information characterizes the desired shape (19) defined by the adapter output side (22), in particular the refractive properties thereof.
18. The adapter as claimed in any one of the above Claims, characterized in that it is provided as a contact glass for eye surgery.
- 25 19. A laser processing device for an adapter as claimed in any one of the above Claims in combination with Claim 9, comprising
- a beam deflecting unit (6, 9) for scanning a laser beam (4) over the certain region, **characterized by**
 - a detecting unit (5, 15) for optical detection of the marking structures (25) by means of the
 - 30 laser beam (4), and
 - a control unit (14) which reads out the detecting unit (5, 15), controls the beam deflecting unit (6), determines the information characterizing the adapter (12) and considers said information when controlling the beam deflecting unit (6, 9).
- 35 20. The laser processing device as claimed in Claim 19, characterized by a pulsed treatment laser (3) for an ophthalmic procedure, wherein the object is the cornea (17), with the control unit (14) controlling the beam deflecting unit (6, 9) and the treatment laser (3) such that the laser beam (4) generates optical breakthroughs at predetermined locations (13) in the eye (2) and, in

doing so, considers the desired shape (19) of the surface of the cornea (17), which shape (19) is identified by said information.

21. The laser processing device as claimed in Claim 9 or 19, characterized by a pulsed
5 treatment laser (3) for an ophthalmic procedure and by a means for reducing the laser beam energy, which means at least temporarily reduces the energy of the laser beam (4) emitted by the treatment laser (3) for optical detection of the reference structure (25).